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**APRIL 1947**

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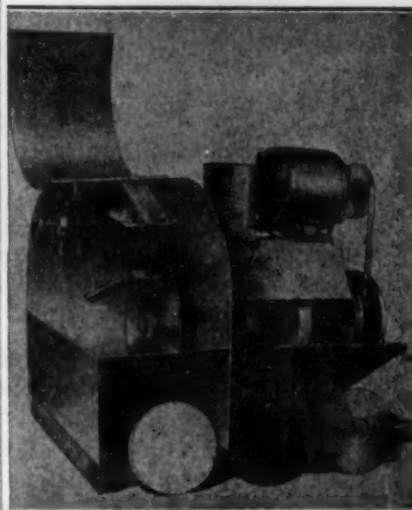
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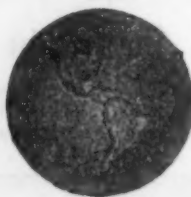
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## Contents

	Page
Famous Lost Mines . . . . .	3
The Origin Of Dolomite . . . . .	10
Ground Water . . . . .	12
Iron Ores & Their Formation . . . . .	14
Fossil Fish . . . . .	16
Letters To The Editor . . . . .	26
Geology Quiz . . . . .	35
Cover Photo . . . . .	37
National Federation . . . . .	39

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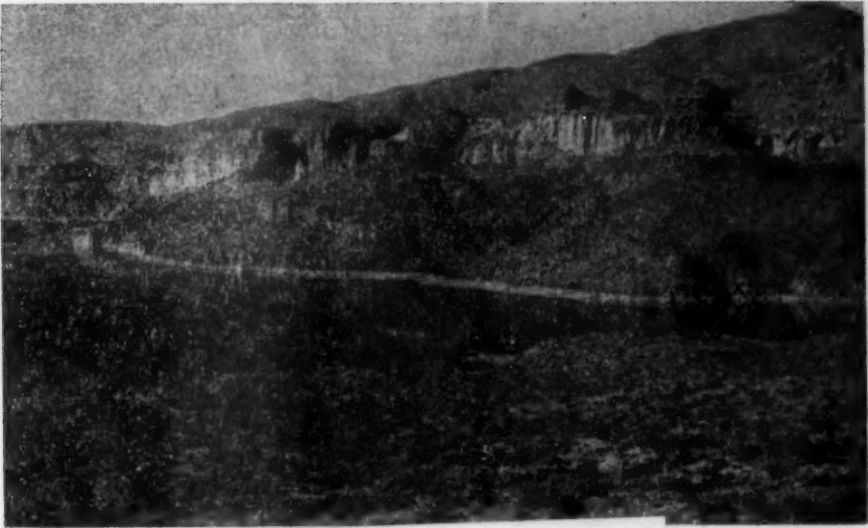
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## FAMOUS LOST MINES

— A Series —

**Victor Shaw**

(1)

### THE "LOST DUTCHMAN"— FACT, OR FABLE?

COUNTLESS TALES of "The Dutchman", Jacob Walz, and his mysterious hoard of rich gold ore have sifted down to us for more than half a century, since his death in 1891 at Phoenix, Arizona.

Most exciting yarns, these, of a vein of red quartz in the Superstition Mountains that is at least 50 per cent pure gold. And they say Walz murdered his partner, Wiser, to get this gold ore for himself; also, when on his death bed, Old Snowbeard boasted that he shot down eight of the snoopers who tried to trail him to his secret bonanza. Too bad the cagey old sinner then died, without leaving any adequate clue to the location of his fabulous hidden treasure.

But, true or not, they are thrilling stories in the best dime-mystery tradition, of daring, danger, and death: about an Apache massacre of an entire pack mule outfit, because the miners had profaned the sacred mountain of the Indian thunder gods; stories of rare old parchment maps that guide you to gold ores, of cryptic Spanish symbols carved in living rock which indicates gold mines, and of sun bleached human bones, bullet riddled skulls, queer rifle shots from nowhere and an ancient curse on gold hunters who invade these super-heated canyons.

No wonder these tales have stirred the cupidity of thousands of fortune seekers right down to this present year. Today, however, these accounts are mostly of hearsay type, yet sworn to be gospel-true. You know, very hush-hush stuff, whispered in guarded asides into avid,



Looking Northeast towards Black Top Mountain.

credulous ears of sucker tourists, or the many who believe anything told them if they hear it often enough. We've heard plenty like this:

"Look, this is straight goods: I *know* where the Lost Dutchman is at. Gotta map 'at gives the exact location. See? Yeah, that's right, it's the map Jake Walz drew just before he died."

And, like this: "Oh, sure, I found the Lost Dutchman and I staked it. No doubt about it. There's the rock outline of the horsehead in the cliffs above it, like old Snowbeard told it; and the afternoon sun shines in the tunnel, like he said; and it's only a short climb to where you can see the 'Needle', too. Lotta the cliff fell over the tunnel, but it's in there all right. Gotta blast rocks off, 'at's all."

Many equally confident statements of the sort, we heard last winter from week-enders seen hiking into this cactus-studded chaos of corkscrew canyons, bouldery dry washes, and sawtooth peaks. Yes, we were in there and we heard plenty more from the lost-mine hunters camped all over the place. Stumbled over 'em everywhere, back-packing up canyons and over ridges, their

camp-fire smoke drifting above the palo verde and manzanita fringing creeks in all canyons with a water seep. Water is vital in this dry hell.

They pass tight-lipped and dead pan, guarding their secret dope of factual (?) details about Spanish rock symbols, lopped-off cactus tops, flat stones stuck into saguaro boles, and other dead-sure guides to the mine or cache of alluring gold they all are after. Maps too, of course. Shucks, they're a dime a dozen. Everyone has them, for there are hundreds floating around, all of 'em *real*—for a price.

Not only maps, but also there are the scores of newspaper accounts, magazine articles, and the many books; much of this written by facile typers with acute ears, but little knowledge of mines or ores, who pad their stories with imaginative ideas and conclusions of their own. So the tales become more twisted and exaggerated. Even numerous radio broadcasts have assumed these stories are based upon facts.

Looks like they *should* be true, eh? When everybody locates the site of this secret treasure in exactly the same place: forty-odd miles due east of Phoenix and close behind Superstition Mountain; within a two-mile radius of the famous basaltic rock pillar, now mapped as the "Weaver's Needle"—though Peralta called it "El Sombrero".

It's not a large area, only about twenty-five square miles. You'd think, considering all the prospecting there for so many years, that some trace of this much publicized gold ore would have been found. All right, tell that to any of them and you get this:

"We-ell, history says that after the big massacre, the Apache squaws worked months covering every one of those Spanish shafts and tunnels up completely, then planted cactus and greasewood on top."



Victor Shaw at his home in Siebre Canyon, California

"Sure," you retort, "but that was back in 1846, and Jake Walz found his stuff twenty-five years later, in 1871; and he is also claimed to have located one of the original Peralta mines, at that."

"That's right," they agree, "but you forget the big 'quake', of 1887. That heaved cliffs over, and probably covered Walz' mine. It sure made things tough, but there still remain the Spanish trail markers and mine symbols cut into the rocks. We can use them, eh?"

Always, the fortune hunters can explain everything.

And always the amazing publicity goes on, for beyond doubt this lost mine has had more free advertising than others of its type. Why, there's even a good-sized monument recently erected to "honor" and commemorate this character—a killer, by his dying confession. It stands in a tiny park across State Highway 88 and opposite the road-side cafe at Apache Junction, and above an inscribed bronze tablet a group of figures shows Old Snowbeard and his pack

jack trekking out a load of the historic gold ore.

But, how to account for all this? What's hidden behind it?

Well, it's anybody's guess, though it does make one think of modern high-pressure salesmanship, and wonder who profits around here. However this may be, the fact remains that this flood tide of publicity has annually attracted many thousands of avid fortune hunters from all over the nation, most of them in the past half decade.

Phoenix boasts, and rightly, of its marvelous all-year sunshine, its increasing yields of cotton, dates, and excellent citrus fruits, and especially of its great suburban acreage of vacant lands bordering the transcontinental highway to the east and south. It just happens that this "Lost Dutchman", located right in its backyard, is an added attraction. Mighty poor business not to make the most of it.

At any rate, recent events have worked that way. Of these out-of-

State hordes, who flock into the Superstitions each year for a look-see, it goes without saying that a goodly portion like the climate and general prospects, and either stay, or plan to return and locate. And city real estate firms have prospered greatly since 1941, despite the necessary bans of war; for, in the last few years, new building on both sides of U. S. 80 eastward between Phoenix and Old Superstition, has certainly grown apace: new dwellings, ranches, cafes, and a large hot-springs health resort that does an increasingly fine business.

We've had a chance to observe this swift growth; having been there in '41 and '42, and again this past winter driving through this suburban district, when we found it so changed as to be hardly recognizable. New house foundations being dug on both sides of the highway for miles; tractors levelling the broad acres of sagebrush, dozers digging irrigation ditches and clearing land, stucco and framed buildings going up all along the route, wells being drilled for necessary water, and all this extending even to the south toward Florence Junction. The paved highway itself had been widened, from a 2-laned to 3-laned size.

Added to this, the hunters for lost mines bring in plenty of *dinero* for city merchants, cafes, motels, and filling stations. They all need prospecting tools, camp outfits and clothing, food supplies, gas, pack stock, maps, cameras, and whatnot. Motels and trailer camps all have the "no vacancy" sign up. Can't get a room in a hotel, and many stocks of merchandise are kept constantly depleted. Looks as if Phoenix soon will be running neck-and-neck with Los Angeles in its rapid expansion of population—and the "Lost Dutchman" helps it plenty.

Moreover, there is a city club which, during each March, conducts a large party of these eager gold

seekers on the trail of the famous lost Dutchman. We heard about one recent party that is said to have numbered some 2,000 men and women. The arid canyons around the Weaver's Needle fairly swarmed with supposed sight-seers, although we suspect each one hoped Lady Luck might aid them to hit the jackpot.

However, reports state that no one got anything, beyond a choice collection of peeled noses, saddle sores, and heel-blisters. Nor, so far as we can learn, although this limited area has been combed and re-combed through the years, has anyone else found anything. Furthermore, it is our humble opinion, that no one ever will.

You ask why we think so? Well, this brief paper is an attempt to give the answer, for it outlines our geological studies there during nearly three months of the winter just past. This was our third expedition into the Superstitions; the two previous ones, in the fall of '41 and in February of '42, were too short for serious work and thus served merely as a preliminary reconnaissance.

And note here, that at no time were we hunting lost mines.

On the contrary, we've always considered that to be nothing but a waste of time. All prospecting is



Base Camp at "First Water," Arizona.



more or less a gamble, even if using the modern geophysical instruments. But, if the time and money spent in chasing these will-o'-the-wisps is used for legitimate prospecting of geologically favorable areas, the usual gamble is reduced to at least an approximate 50-50 bet to win success. And that this idiotic scramble for the Dutchman's gold is an excellent case in point, we hope to prove herewith to everyone's satisfaction.

You see, having learned from the State Bureau of Mines, that this Superstition region has never been geologically surveyed, our expeditions were planned solely for the purpose of examining local rock formations. If they proved of the type favorable for gold deposition, then prospecting by usual field methods would be warranted; and we had reason to believe gold had been found somewhere in the region, it being a matter of smelter records that, in 1914, C. H. Silverlock digging at the site of the massacre of the Peralta party recovered some \$18,000 in scattered gold ore. Also, we had ourself seen some very good gold asserted to have come from a place in the southeastern portion of this area, during our trip of 1941, and we visited that place in 1942.

It is not germane to our subject, to detail those preliminary trips here, except to mention how we saw this gold, since it has a direct bearing upon our conclusions presented here. One discovery made in 1941 was both important and most surprising: that the Lost Dutchman Mine had been found the previous year, by a Prescott mining man. We got this directly from his widow, who at the time lived with their daughter in a bungalow at the south end of Superstition Mountain, where a steep canyon leads up to Weaver's Needle.

When the lady learned we merely wanted story material, she talked



Weaver's Needle.

freely: that they'd found the Walz mine the winter of 1939-40; that her husband had suddenly died last year, and that she now managed the property and had a crew of miners working. She then detailed just how they'd found this old mine and brought out a stack of fine photographs, of the Needle, nearby canyons, and of the open portals of several queer old mine tunnels. Not only this, but she led us out beside a long stable stacked with pack saddles and other gear, and in a watering trough panned down some gold from stuff she had in a large tub.

She handled the goldpan like an amateur, but did uncover a half-inch string of coarse-fine gold of good color which she dumped back into the tub. There was no ore in the tub. Just gravel and sand, which she told us came from the old Walz mine dump. Well told, her story hung together and should have been convincing, yet several points sure seemed mighty peculiar—such as the absence of quartz-gold ore. However, we said nothing and went our thoughtful way, to explore this South Canyon and investigate the Needle. Then, this being early October, a touch of heat prostration cut short this first expedition.

On our next trip, in February of 1942, we went in on the north side

by the rough four-mile dirt wagon road from Goldfield to the Barkley cattle outfit's line camp called "First Water"—Willow Springs Creek. This time we secured pack stock and saddle horses and camped at the entrance to East Boulder Canyon, in full view of Weaver's Needle, where we managed some serious field work in the nine days we could spare.

On the eighth day we lunched on the high cliffs surrounding the base of the Needle, and looking southeast saw the widow's group of mine shacks in a wide canyon trending south next the southern end of a short range known as "Bluff Springs Mountain", and went down through a maze of rugged canyon and ridge to look it over. We found four miners, assertedly doing the annual assessment work, who made no objection to showing us over the widow's property, though they didn't seem very busy.

This alleged "Lost Dutchman" lay at the base of a series of high buff-colored cliffs, at the point where they met the top of the long talus slope up which we had just climbed. No vein fracture showed in the cliff face; nothing but a vertical erosion-crevice averaging only a few feet of depth, such as later on we found common to this local type of lava agglomerate. We saw no mine workings, ancient or modern; no evidence of any shaft—no tunnel portals anywhere—and no mine dumps, which would easily be recognized even if very ancient,

The only evidence of any sort of work was in the talus gravels at the cliff base, in two loosely connected spots, where some surface excavation had been done. Obviously pick and shovel work. Not new, but perhaps about a year old. There were no quartz seams in the cliff face, nor was there any quartz or calcite float-rock anywhere, upon any of that talus slope, nor at the base of its apron, nor upon the canyon floor itself.

This, absolutely, was all there was to see.

We were invited to stay the night, and after supper we were showed some vials of coarse-fine gold they claimed to have panned out from the gravels at the cliff base. It strongly resembled the gold panned for us by the widow lady, at her bungalow the previous fall. Not that it mattered much, at the time. But, after breakfast the next morning, we left for our camp scenting something decidedly fishy. Had we been given the old run-around? Or, was the real mine elsewhere, and these miners working under orders? This set-up puzzled us.

Figure it out, yourself. But, true or not, what we observed at his alleged mine tallies with our findings here, as will be shown.

Now, before leaving on our expedition last November, we had notified our good friend, Bob Berry, editor of *Earth Science Digest*, who sent his good wishes. Then, learning of our return in mid-February, he airmailed a request for an article describing our venture and its results, to be airmailed for early printing. But, with work piled up, there's been no time for necessary mineral testing.

So, in complying with this request, it must be understood that some rock identifications given are tentative, awaiting a later microscopical study of certain thin sections without which no definite classification can be made. And the rocks in this area are complex. However, matters can be simplified, by first listing the surprising things we *did not* find; following with a general description of local geology, thus avoiding errors while making our conclusions clear.

In the first place, we saw no granites of any type, within the limits of this district, as mentioned above; and, naturally, no pegmatites, nor rocks of ultrabasic type. It is possible though, that those of pre-





Spanish Gold Symbols on Black Top Mountain

Cambrian age may underlie rocks we did find and examine.

Also, what is more unusual and noteworthy, we saw *no quartz!* Nowhere in this twenty-five square miles did we run into quartz in a vein, seam, or stringer; nor was there any quartz float on ridge, hill slope, or valley floor, nor in canyon creeks, or dry washes. This, to say the least, was some surprise package being utterly unexpected. Of course there is aggregate silica in some tuffs and lavas, beside which chalcedony and common white opal are plentiful in the many amygdaloid and vesicular rocks and their float fragments are everywhere underfoot.

Beside this, we failed also to find any calcite; that is, of the massive variety that so often occurs as a gangue mineral in practically all metal mines of our western States. This too was strange, and seemed to indicate an absence of lodes carrying valuable ores and accessory minerals, which we found to be true. There was nothing of the sort to be found anywhere in this area—not even common iron pyrite.

The additional absence of muscovite and both orthoclase and plagioclase feldspar was not surprising, there being no granites, but there also was very little biotite and no hornblende; though the amber mica, phlogopite, was plentiful in all stream sands and so thick upon the ground that it sparkled in the sunlight like a Christmas card.

Further, although metamorphism was noticed to some extent in certain

lavas, we were struck by the total absence of the more common types of metamorphic sedimentaries, such as slate, schist, shale, argillite, sandstone, limestone, gneiss, and so on. Hence we didn't expect to find any clay, and did not—nor any fossils, as it happened.

In general, the lack of the usual ore-forming metallic minerals appears almost complete, for the only metallics observed were hematite and a magnetite probably ilmenitic found only by panning. And our goldpan prospecting was very careful and thorough, in which operation we covered every stream in the drainage basin of this area; this including West Boulder and its numerous branches heading in the eastern canyons of Superstition Mountain, also East Boulder, Needle Creek, Bluff Springs Creek, and the main drainage stream in LaBarge Canyon.

This being an operation of vital importance, we always picked places well known as most favorable for results, panning each creek near its source and in places down its course to the junction with another stream. Always we excavated to bedrock using a spoon for crevice material, thus finding bedrock shallow and not over a foot or so deep. And results were notably negative: we didn't get a color, anywhere!

Black sand everywhere was surprisingly abundant, always consisting only of hematite that often showed oxidization, with also much ilme-

(To Page 23)

## THE ORIGIN OF DOLOMITE

Kenneth J. Rogers

While Marie Antoinette was shouting, "Let them eat cake," a Frenchman, T. de Dolomieu, was discovering that all that is limestone does not fizz. The region where he worked was later appropriately named the Dolomites. Were one to have asked this Frenchman to account for this non-fizzing limestone, he would have been baffled; were one to ask us to account for it we would theorize, but in the main, we are just as baffled as was he. For, where theory reigns bafflement abounds.



Cluster of Curved Dolomite Crystals.

Today dolomite is used in two ways: mineralogically, as the name of a mineral, and geologically, as the name of a rock largely or wholly composed of it. The mineral dolomite is a compound of magnesium and calcium carbonates combined directly in the molecular ratio of one to one  $\text{CaCO}_3 \cdot \text{MgCO}_3$ . Pure dolomite consists of 54.35%  $\text{CaCO}_3$  and 45.65%  $\text{MgCO}_3$ .

Dolomite, it is believed, can be either a primary or a secondary product, i.e., it can be formed through direct precipitation in sea water or by the alteration of pre-existing limestones. The limestones can be altered by the sea water in which it is lying or by hot or cold waters

which may percolate through it, but in both, the manner of change is essentially the same; that is, the water carries the magnesium carbonate which replaces some of the calcium carbonate of the limestone to form dolomite. In the case of percolating waters some of the calcium carbonate may be removed to make room for the incoming magnesium carbonate by leaching. And so the chemical changes may be made at the time of deposition and dolomite laid down as we now find it, or a calcareous mass may be laid down first and then later changed to dolomite.

Most geologists agree that the majority of our dolomite deposits have been formed epigenetically. The theory involved is relatively simple. Picture, if you will, the numerous rivers which have from time immemorial emptied their cargoes into yawning receptive seas that have prevailed helter-skelter upon our earth's surface. Magnesium salts, all alkali carbonates, and an abundance of calcium hydrogen carbonate are assuredly a part of that cargo. They are carried far and wide by marine currents. In the seas a profusion of organisms dwell that can and do convert the soluble calcium bicarbonate into the insoluble calcium carbonate, and thereby, produce hard parts which either protect or support their soft parts. Upon their death they give up their skeletal part to the media in which they lived. A natural decree. Thousands upon thousands of such calcium carbonate parts are dropped and accumulated. To this may be added the lime from various lime-secreting algae.

To this batter of freshly laid calcareous sediments, a cup of magnesium carbonate is added to form dolo-

mite. However, whereas organisms are largely responsible for the precipitation of calcium carbonate, the physical and chemical conditions which lead to the precipitation of magnesium carbonate are not known; likewise, the utilization of magnesium by organisms is unknown. At any rate magnesium carbonate does precipitate and falls to the sea floor where the lime is already lying. Then it is postulated some of the calcium carbonate is taken into solution and replaced by a chemically equivalent quantity of magnesium carbonate, or that the two carbonates lying promiscuously together are, upon crystallization of the sediments, converted to the double salt. An ideal assumption would be:  $2 \text{CaCO}_3 + \text{MgCO}_3 = \text{Ca Mg} (\text{CO}_3)_2 + \text{CaCO}_3$  in solution.

The primary theory is even simpler than the epigenetic one. The same story as has been depicted above can again be envisaged, only it need not go so far. The soluble carbonates supplied by the rivers unite with the magnesium element of the sea and form dolomite. Given such reagents, soluble double carbonate and sea water rich in magnesium, the exchange of elements is fundamental, the resultant product being dolomite which as an insoluble passes by way of precipitation from the field of action according to the laws of chemistry. However, notwithstanding the plausibility of the action, the theory of the thing becomes apparent when we learn contrary to expectations that examinations of present sea floors have revealed very little dolomite.

We can with justification say that the preponderance of our dolomite originated in warmer climes, for in warm water a sharp increase of denitrifying bacteria is noticeable; and

these organisms by their physiological processes are responsible for the throwing down of huge quantities of lime carbonate. Then too, tropical rivers carry magnesium and calcium salts to the oceans at a faster rate than elsewhere. The core and samples from a well drilled on Funafuti Atoll shows that magnesium carbonate decreases at depth. This would seem to prove that dolomite originated in shallow water, but certainly does not prove that shallow water is requisite for the birth of dolomite. That dolomites were universally formed under reducing conditions seems likely inasmuch as ferrous iron is present in a surprisingly large number of the dolomites. The iron percentage runs anywhere from 10% to less than 1%. Since ferrous iron is readily oxidized, its presence negatives the view that dolomites developed through replacement by ground water. The big three involved in producing dolomite, i. e., time, temperature, and pressure are, as usual in the fashioning of Nature's wares, mysteries. Laboratory estimates have been made based on attempts to simulate nature's environmental conditions, but much more has yet to be done before the origin of dolomite can pass from the realm of theory.

The fact as to how magnesium got into dolomite may be somewhat of a puzzle to all peoples, but that it is there the English can well testify. When the order was given to build the houses of Parliament, dolomite was chosen as the building stone, and the buildings subsequently became, because of the sulphurous fumes of nearby potteries, corroded with a layer of epsom salts affording to the people who would but scrape the walls, a free purgative.

## Ground Water

W. D. Keller

From ground water and its work come many useful and interesting earth features, such as springs, caves, agates, petrified wood, many ore veins, gem and mineral deposits, artesian water, geysers, sinkholes, landslides, and the water which sustains the plant life, in turn eaten by animals—and supporting man. Food, scenery, ornaments and minerals for our civilization, these are the contributions of the unobtrusive water residing and moving under the surface of the ground.

Water enters the ground mainly from rain and snow above, although some soaks in from streams and bodies of standing water. Some is added from magmas below. It soaks downward to a thousand or so feet, but may move many miles laterally and emerge as a gentle seep or as a rushing underground river spring. Much ground water moves outward and returns to the air through evaporation or transpiration by plants.

In a humid region one may dig down a matter of 10 or 20 feet and strike water, certainly so if the hole penetrates the zone below which the rocks are saturated. The top of the zone of saturation is called the *ground water table*. The depth of the ground water table below the surface varies with the topography, and fluctuates with the seasons. It is usually closest to the earth's surface in the bottoms of valleys, and deepest on hill tops, unless modified by the presence of porous, permeable, or impervious rocks. During wet seasons it rises close to the top of the ground.

A productive shallow well is bottomed below the ground water table, and a hillside (so-called) spring is located where the ground water table intersects the surface of the land.

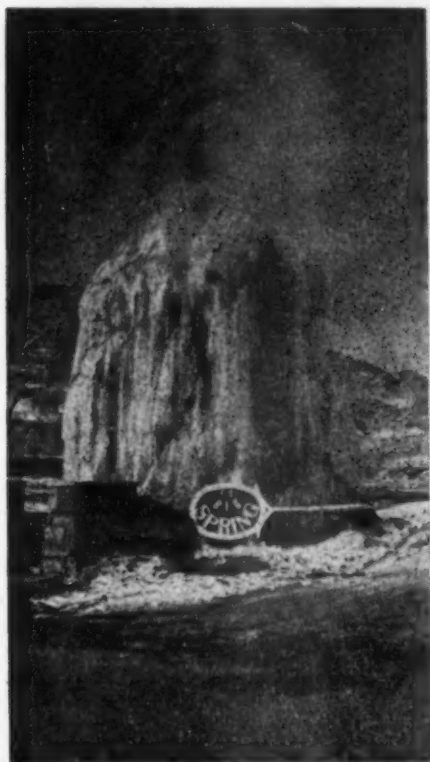
If either goes dry during a dry season it indicates that the ground water table has dropped below the bottom of the well or spring. Because shallow wells and springs are fed by surface water which has seeped downward there is always danger of pollution of water by sewage from man or animals. Fortunately, air which is present in the soil, and is carried in solution by descending surface water destroys by oxidation many bacteria and organic poisons in ground water. However, open cracks or channels are common in near-surface rocks and these convey polluted water in fast flowing, highly productive "veins", so that one can never be certain that any shallow water source in an inhabited region is safe. One can NOT rely on cold, sparkling, crystal clear water to be potable. Follow the advice of the military—either boil it or add Halazone tablets.

Deep well, artesian water is another thing entirely. Artesian conditions occur when several essential geological requirements are met. An ideal situation is where a sandstone or other rock formation containing open pores or crevices (a permeable rock) crops out at a high elevation where water is available, as rain, snow lake, or stream. This permeable stratum (formation) must dip downward, deep beneath the ground and extend at depth, out to the artesian location at a lower elevation. Moreover, a tight impervious (relatively water tight) cap rock bed or layer such as shale, must *overlie* the permeable formation and seal in, or hold down, the water in the permeable formation. To recover the water, one drills a well at a lower elevation down through the shallow water zone (usually casing it off) and on



deeper, entirely through the impervious cap rock, into the permeable rock. Now the water rises in the well because of the water pressure in the formation behind it. The well is artesian when water rises in it, because of hydrostatic pressure, but it need not flow at the surface to be truly artesian.

Some artesian wells furnish salt water which is salty ocean water that was entrapped in the sandstone at the time of its formation, that is, when sandstone was deposited on the ocean floor. This water is called connate water.



A Hot Spring in Yellowstone National Park.

Hot springs usually derive their heat from an underlying magma, or from cooling igneous rocks. The hot springs and geysers of Yellowstone Park owe their thermal activity to



Big Spring, Carter County, Mo. A really big spring — one of the largest single orifice springs in the United States. Flowed more than 250 million gallons per day, averaged for 14 years. Flows more water than that used by the city of St. Louis, Mo.

such a source. An explanation of geyser action is a story in itself and will be given in a later issue.

Caves (excluding lava and sea caves) and sinkholes develop in rocks which are soluble in a ground water, namely: limestone, dolomite, and gypsum. In many parts of the Appalachians, in Kentucky, Missouri, Texas, New Mexico, Colorado, Utah, California, Florida, South Dakota, and elsewhere, thick limestone formations occur which are transected by joints and bedding planes. Ground water containing carbon dioxide which was dissolved from the atmosphere and the soil atmosphere—thereby becoming weak carbonic acid—slowly *dissolves* channels in the limestone as it migrates and trickles from paper-thin crack to crack, and bedding plane to bedding plane. Centuries later the enlarged solution channel may be almost entirely drained of water, and dis-

(To Page 24)

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## Iron Ores And Their Formation

(Reprinted from "The Pick & Dop Stick", official organ of the Chicago Rocks & Minerals Society.)

Arthur Sanger

The manner in which certain minerals became concentrated into ore beds is one of the most interesting phases of geology. The minerals and metals were formed by the heat and other physical forces at the time of the formation of the earth as a separate planet, but most, if not all, were sprinkled so thoroughly in the heterogeneous mass that their recovery and use by man would have been impossible. Various geologic agencies have since that time operated to bring together these materials in enriched deposits.

In the case of iron ore, as in coal, the principal medium was plants. In its original condition iron was abundant but widely disseminated in the soil, constituting the red coloring matter of sand, clay and rocks. But this ferric oxide (hematite,  $\text{Fe}_2\text{O}_3$ ) is ordinarily insoluble and hence would not be leached out of the soil and rocks to collect in ore beds. But plants grew in the soil in the water of shallow seas and the oxidation (decomposition) of dead organic matter took up some of the oxygen of the ferric oxide, converting it into ferrous oxide  $\text{FeO}$ . But the acids produced by the decomposition of organic matter, chiefly carbonic acid, united with the ferrous oxide to form iron carbonate (siderite,  $\text{FeCO}_3$ ).

The iron carbonate is readily dissolved by water containing carbonic acid decolorizing the soil and is carried by the water to an emerging spring. If the water enters a peat bog where there is an abundance of carbonic acid the carbonate is deposited without changing its chemi-

cal structure. But if it flows out on the surface it rapidly oxidizes, that is, it exchanges its carbonic acid for oxygen from the air and becomes again what it was in the beginning, ferric oxide.

Thus an entire cycle is completed and we have ferric oxide at the start and finish. But in the first instance it was impregnated throughout a large area of rock and soil and in the second exists as a layer of hematite which, with a secondary enrichment similar to the first, is capable of being mined, smelted and used by man.

The Fentons, in *the ROCK BOOK*, describe the formation of the rich Lake Superior iron ores, as formed from dissolved iron and silica compounds carried to the shallow seas of pre-Cambrian times. "Most of the silica settled in jelly-like layers, though much was deposited by algae, that grew on the sea bottom. Deposition of iron, however, depended on bacteria. These tiny one-celled plants (probably diatoms—A. S.) are abundant in bogs, lakes and quiet shallow seas today, and they cause iron compounds to settle even from water that contains less than two parts of iron per million. Dissolved iron compounds were much more plentiful than that in those ancient seas, so that the deposits, which also contained much silica, became thousands of feet thick.

They were not iron ore, however, nor were they hematite. When they formed, the iron-bearing sediments were carbonate (siderite) and silicate (greenalite), scattered through beds of chert and jasper. As these



beds became land some were squeezed, crumpled, broken and changed, while others merely were lifted. At the same time rain water seeped into the ground, turning the iron compounds into hematite and limonite. By this process the proportion of iron to impurities was at least doubled, while the weathered ores sometimes became so soft that they can be dug with steam shovels." (Pp. 209-10)

Of the four forms of iron ore, 90 per cent of which are sedimentary, hematite, the red iron ore, is the most important. Some of the Lake Superior deposits are mined from open pits with electric or steam shovels as just mentioned. These softer deposits are expected to be exhausted in 75 or 100 years. The larger copper deposits, the first to have been mined in the United States, in the same area as the iron deposits, are nearly exhausted now. Next in importance, especially in Europe, is limonite,  $2\text{Fe}2\text{O}3.3\text{H}_2\text{O}$ , yellow to brownish iron ore, the coloring compound of yellow clays and jaspers. This is the bog iron ore previously described. We are not positive but think the Alabama iron ore is limonite. Most of the iron ore of Colonial times was limonite. Next is siderite, the carbonate, usually combined with iron sulphate. This is the coloring matter of the slate colored or gray clay which make nice red bricks since, on heating, the iron carbonate changes into ferric oxide. Iron carbonate quickly weathers to dark brown or black as it oxidizes into limonite. The clay-ironstones of the Wilmington (Illinois) coal mines are impure siderite. The concretions are a characteristic form of siderite and these in particular have our interest since they contain Pennsylvania plant fossils.

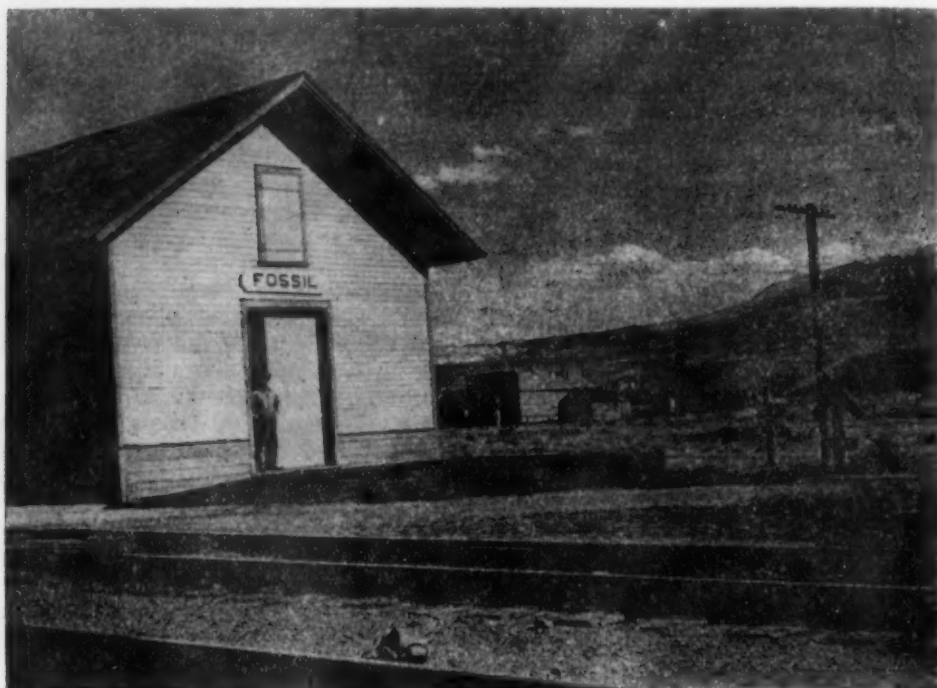
Hematite and limonite are both sometimes oolitic, that is, form a lot of concretionary spheres around a particle of mineral matter, the spheres being cemented together

with iron or silica into a solid rock. The hematite of the Clinton formation of the Silurian era, mined in the Appalachians, has, in addition, fossils of shells of various sorts, usually but not always broken by movement and metamorphism. It is often called fossil iron ore. Limonite was used as a pigment by early peoples for their yellow paints. Hematite is the constituent of red "barn" paint usually made from pulverized Clinton ore. Some of the jaspers found in the iron mine areas of Minnesota, known to rockhounds as algae jaspers, have nice patterns of oolitic circles and wavy lines and make nice cabochons.

The other iron ore, non-sedimentary, is magnetite. It accounts for about 5 per cent of the total iron mined, principally in New York, New Jersey, Ontario and Brazil. It is a black ore, is attracted by a magnet and some of it is itself a magnet, being the lodestone dreaded by early mariners. It is found in igneous or metamorphic rocks, the Canadian deposit also being in the pre-Cambrian System.

It will be noticed that most of the iron in North America comes from the Archean rocks of the Canadian Shield. These are the oldest rocks known in the world, no one has ever seen what underlies them. No definite fossil remains of the long pre-Cambrian era have been preserved because of the tremendous vulcanism movement, mountain upheavals and metamorphism which has ensued. But the Cambrian rocks overlying the Archean show us a plant life already well developed, definitely pointing to a long prior existence of this life, at least in simpler forms. And to the long ages of the growth of these simple plants we owe all the iron ore we have today. The iron ore is proof of the existence of plant life in pre-Cambrian times. As LeConte in his *ELEMENTS* of

(To Page 21)



Fossil, Wyoming — Locality for the world's finest fish fossils.

## FOSSIL FISH

By Henry P. Zuidema

A fishing trip it was, and fish we caught, but we were about fifty million years too late to have them for supper.

Western Wyoming has countless attractions for the tourist, sportsman and geologist and among these attractions are some not so well known to the public as Old Faithful, the Tetons and the Red Desert. Count among these lesser known wonders the amazing fossil fish of Wyoming.

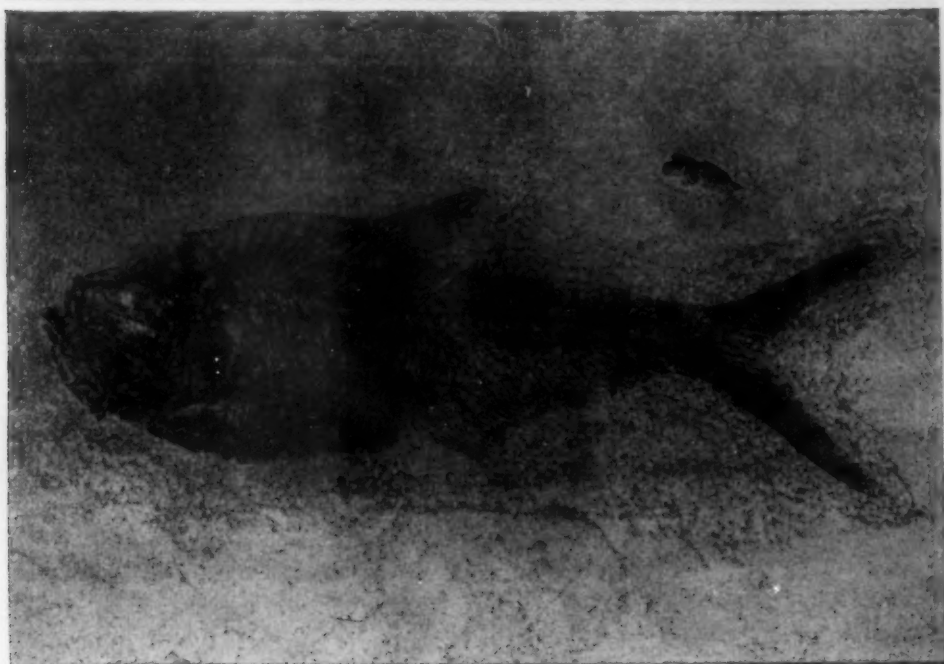
The rock in which these fish are found is an oil shale. Scratch it with a knife and the pungent odor of petroleum arises from it. This oil shale of the so-called Green River beds may become of great importance to the car driver in years to come and we wanted to collect specimens of it for our Detroit collection and to search for the remarkable fish

which are sought by museums the world over.

So our car carried us along U. S. 30 to the town of Green River and then over mountain grades and rutted desert roads to the vicinity of the well-named station of Fossil, Wyo., on the Union Pacific near the Utah boundary.

Here is the happy hunting ground of the fisherman who cares not that nature long ago has picked clean the bones of his trophies.

The Green River shales have a total thickness of 2,000 feet and represent slow accumulation of sediments in water over a period of several millions of years in the remote past, during the Eocene epoch, when a vast lake existed in this region. The "fish rock" occurs only in thin layers, accessible to the fossil-fish



Green River Fossil Fish

hunter where the rock has been exposed on mountain flank or in river valley.

An amateur who has become an expert at finding the hiding places of the fossil fish of the Green River shale is David C. Haddenham, who came to Wyoming from England as a boy and who has been chipping away in the fish beds intermittently since 1895, with time out to work on the railroad as switchman, brakeman and conductor.

After an exposed ledge had been explored, Haddenham did not give up. At one place on a mountain slope he cut an excavation 30 feet square and 30 feet deep, removing approximately 27,000 cubic feet of rock by hand, unaided. He has been rewarded by some unusual discoveries, among them two sting rays, members of the shark class of cartilaginous fishes, the radiating network of their fins exquisitely preserved in the rock. Occasionally he has discovered an ancient gar pike, whose

descendants still live in North and Central America.

Climbing about on rock which once was fine, limy sediment on the bottom of a vast inland lake, we were fortunate in finding several fish for the Wayne collection. The shape of the fish is shown by a mere film of carbon, representing the flesh. Mineral matter also has replaced the bones, preserved to the tiniest of fin rays and spines. Only the expert usually can detect the presence of a fish in a freshly split slab of rock. The fish must be worked out in the laboratory. Fortunately the mineralized bone is harder than the enclosing shale and patient work with a steel brush reveals the entire specimen.

Rarely a slab splits along a "bedding plane" on which a fish appears, but in this case the specimen is seldom complete.

So well preserved are these Green River fish that the expert finds little difficulty in identifying the more



In no rush to find a frying pan is this fossil hunter. The fish has been preserved in rock for 50,000,000 years.

common species as a kind of fresh or brackish water herring, whose descendants are still in existence.

The lake beds were deposited in middle Eocene time, an inconceivably long time ago in the mind of anyone except the geologist, who places this chapter of earth history well up in the rock column. The fish most common in the shale are all of the "bony" types, or "moderns" among the great and bewildering array of fish families which have inhabited the waters of the earth since early geologic time.

The Green River shales cover some 50,000 square miles in southern Wyoming and northern Utah and Colorado and the unusual expanse of the horizontal layers, high above the transcontinental highway, never fails to arouse the curiosity of the tourist. On close inspection the

shale is found to consist of incredibly thin layers, forming light and dark pairs, each pair probably representing the annual deposit in a great lake, or series of lakes. The light-colored layers are largely calcium carbonate, which was precipitated when the water warmed up in summer, and the dark layers are chiefly carbonaceous, consisting of what once were spores of fungi, pollen, insects, and floating microscopic organisms which sank more slowly and came to rest upon the limy precipitate.

Does the discovery of large numbers of fish in a few layers indicate a sudden change in water conditions or an epidemic such as killed millions of smelt recently in northern Lake Michigan? The geologist as yet does not have all the answers.

(To Page 23)

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(From Page 15)

**GEOLOGY** says: "In any case, organic matter has been the agent in some stage of the change; and, therefore, in this case, as in all other cases, iron ore is the *sign* of organic matter, and the *measure* of the amount of organic matter consumed in its accumulation. There are, therefore, three signs of the previous existence of organisms used by geologists; they are *coal*, *iron ore*, and *fossils*.

### GEM EXHIBIT

The Nebraska Mineralogy and Gem Club will hold its second exhibition at Joslyn Memorial Art Museum, May fourth to thirty-first inclusive. Work of both Iowa and Nebraska artists will be on display. The exhibition is open to the public and free of charge. Eldredge R. Long is chairman.

### NEW FOSSIL BIRD

Dr. Alden H. Miller, University of California zoologist recently announced the discovery of a new species of fossil bird from the Rancho La Brea tar pits at Los Angeles. The bird *Pandanaris* is a pre-historic relative of the modern blackbird. Descriptions of the new specimen were published in the *Condor*, a journal devoted to bird study.

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(From Page 18)

Of more immediate concern, at a time when discoveries of new pools of crude petroleum are not keeping pace with the consumption of gasoline, is the use of the oil shales of the West as a source of oil. Sealed in the Green River formation are an estimated 76 billion barrels of oil, the shale holding from 10 to 70 gallons per ton of rock. As long as supplies of petroleum from our wells are available, shale oil is not needed, but probably by the time your 1965 model is delivered, shale oil may well be an important source of gasoline.

The government is interested in the problem to the degree of authorizing a huge research project under jurisdiction of the Bureau of Mines. A \$500,000 laboratory has been constructed on the campus of the University of Wyoming at Laramie. And a \$1,500,000 demonstration plant is being built at Rifle, Colo., to determine the cost of production of oil from the shale and to assist private industry in this field.

An experimental mine, with a production of 200 tons a day, is in operation near Rifle, mining oil shale that once formed the spawning beds of fish which, with myriads of other ancient denizens of the deep, may, according to some of the investigators of the mystery of the formation of fuel oils, have contributed to the supply of "rock oil" you may use in your car someday.

(From Page 9)

nitic (?) magnetite in glittering tiny rounded grains, and usually a liberal amount of minute almost microscopic clear pale yellow crystals looking like sanadine, or topaz, though not yet fully identified.

Here, we might end description and start to summarize; for, recalling the fantastic yarns about rich gold ores here, our contrary claim appears already to be proved. Cer-

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tainly, no prospector of much field experience could hope to discover commercial ores in a formation like this, particularly gold ores. For it appears to be merely a geologic wonderland, with its heavily eroded and colorful outpourings of diversified lavas still needing much study. And the only prospectors to be

(To Page 25)

(From Page 13)

covered by a hunter, Boy Scout, or cowhand. It is a cave. The significant part of its geological history is that the cavity or channel was largely dissolved.



Sink Hole in Illinois.

The writer has frequently recalled his disgust at hearing a loud-spoken, misinformed, self-appointed narrator telling all within ear shot that the cavernous chambers, long galleries, and winding channels of the incomparable Carlsbad Caverns were formed by a "vast volcanic upheaval". Actually a quiet, long continuing solution did the job. Sink holes originate when the roof of a cave collapses, or if the cavern is extended to the surface of the land. See photograph.

After a cave has been partly drained, water which is saturated with limestone in solution may emerge from cracks in the cave roof and evaporate. Calcite or other deposits may be deposited from the evaporating water and leave stalactites (rock "icicles") on the roof, or stalagmites on the floor. Various curious dripstone, flowstone, and concretionary deposits, some of which because of their odd shapes almost defy detailed explanations, are common in large caves.

Ground water not only deposits minerals in open cavities, but it effects the replacement of pre-existing rocks, minerals, or organic substances by mineral matter carried in solution. One famous example is the Petrified Forest of Arizona. Millions

of years ago the trees of the present forest were buried in a sandy, clay formation. They were protected from decay in the air by their cover, and were preserved so well and so long that silica which was later carried in solution by ground water took the place (replacement process) of the wood, molecule by molecule. Fine wood texture, bark and grain, have been preserved in detail. Small amounts of coloring oxides, like those of iron and manganese, colored the petrified wood red, yellow, purple, and various shades between.

The practical miner or collector of ore minerals will point to many examples of replacement of one mineral by another. Secondary enrichment may have been concluded by the replacement process.

On the mechanical side of the work of ground water we recognize the movement of colloidal fractions of soils to the subsoil, and the startling effects of landslides which occur when a hillside or a mountain side becomes water soaked and slides its heavy weight on a slippery, water-lubricated base.



Round Spring in Shannon County, Mo. The orifice is about 80 feet in diameter. Site of Round Spring State Park, a beautiful camp, fishing, and recreation spot.

Large or well-known springs occur in Georgia, Florida, Missouri, Colorado, Wyoming, Idaho. Almost every Chamber of Commerce, except for one or two in desert regions, will probably feel offended because its

locality was not included in the above list, so common are springs. Artesian conditions occur out from the flanks of almost every mountain range. Petrified wood is far from rare, although most localities lack the brilliant color of the Arizona forest. The many ore veins which are ground water deposits deserve a special discussion for themselves and they will be so treated at a later time. Perhaps the study of ground water is so fascinating because it goes on partly hidden from view—it has just enough mystery and glamour to stir our imagination along with the most prosaic of scientific facts.

(From Paeg 23)

attracted are gemologists, of which already there are a few in residence near Superstition's west flank, on dirt roads from U. S. 80.

However, for those interested, we will try to describe the major geologic features of the locale, where much rather recent volcanic activity seems centered. The dominant rocks appear to be basalt, of which there has been at least two periods of flow: one Tertiary, the other either Quaternary, or possibly Pliocene — anyway, much later than the well known great general Eocene upheaval in this State.

This second lava flow appears to have been quiet outwellings from fissures, which subsequent erosion has left in the form of numerous dark-red dikes jutting to quite a height above the general ground surface. It also formed sills in surrounding mountains of more or less thickness, and probably at the same time; for, so far as observation was possible, all these dikes in canyons and open basins are joined to and are component parts of the red basaltic sills. The coloration of dikes and sills is from the contained hematite heavily oxidized.

## OUR SPECIAL FOR THIS MONTH

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Obsidian in all its colors, as many as six different on one slab. Gold, Silver, Green, Red, etc., on one cabochon, brooch set or pendant. 10 square inches of slabbed choice material postpaid for .....\$1.75

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The much later Quaternary (?) basalt forms a capping upon all the higher mountains in this vicinity, and usually is eroded into the prevalent sawtooth pinnacles visible everywhere on the skyline. This basalt is a tough black dense-textured rock, of the olivine-free type.

The next most striking feature are the numerous great buff-colored cliffs resting directly upon the Tertiary basaltic sills, all of them capped by Quaternary basalt. The cliff exposures with their black tops and bright red bases easily form the most striking portion of the local landscape and are agglomerate tuff, apparently porphyritic rhyolite, very massive and compact in the general mass.

But they are porous on top, showing excessive erosion, and a dozen feet or so of their bases that rest on the basalt sills are amygdaloidal. The cavities large and small doubtless due to gas bubbles. A few cavities seen were six by eight feet on bottom and in places almost seven feet high. A few also have some holes eroded through outer walls, thus making windows for a fine camp spot in stormy weather. But a majority of these are far smaller, mostly mere cave-like hollows.

Fresh fractures of these cliff rocks are white to pale gray, but they all weather buff. Hand specimens show a siliceous aggregate in a kaolinized matrix, and some strain-cavities are lined with clusters of small quartz needles. For some distance in places these rocks are softened by predominant kaolin, while large areas elsewhere have a dominating silica producing a hardness and texture like quartzite. But all this tuff has profuse inclusions of rounded and extremely tough basalt embedded in kaolin matrix, the nodules seen ranging from small to baseball size, with a few as large as a modern football.

(To Page 32)

## Letters to the Editor

Dear Sir:

Enclosed please find check to cover your back numbers, October, November, December, January, and February. The Digest's that come to me get pretty hard use. They are read and reread many times so I decided this way I could keep a copy of each in good condition. If you get extra copies of the August and September 1946 issues I would like one of each.

Very truly yours,  
Agnes H. Rexsen,  
Florence, Oregon.

Gentlemen:

Just received a copy of your March issue. It's a thousand percent improvement over all previous issues. Keep up the good work.

R. L. Patterson,  
Boston, Mass.

Gentlemen:

Enclosed find \$1.00 for the five back issues of the Earth Science Digest. If at any time it becomes possible for me to get the August and September '46 issues please let me know. From the standpoint of a very inexperienced amateur in mineralogy I would like to say that such articles as "Real Gold and Fool's Gold" in the March number, which give the novice a chance to learn the simple points first are greatly appreciated.

While I'm writing this may I say that an article explaining methods of panning gold might be very well accepted out here in the west where so many of the streams that the rock or mineral collector have access to can be panned for gold.

Congratulations on a swell magazine.

Very truly yours,  
Darrel L. Brown,  
Fair Oaks, Calif.



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Scheduled meeting of the Central  
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Friday, April 4 at 8:00 p. m. in  
Ames, Iowa at the Iowa State Col-  
lege, Chemistry Building, the club  
will be the guest of the geology de-  
partment.

Sunday, April 13, from 3 to 5 p.  
m. the club will be the guest of Dr.  
and Mrs. A. M. Smythe at the  
Smythe's home.

The Central Iowa club is one of  
the most active of the midwestern  
earth science groups. Meetings are  
frequent and well attended. The  
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science throughout Iowa. We urge  
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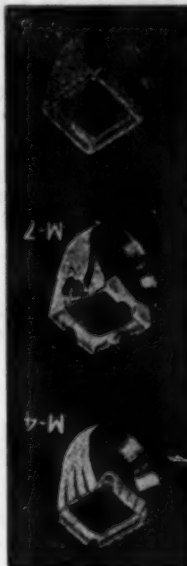
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## LETTERS TO THE EDITOR

Dear Sirs:

Enclosed find check to cover one *Revised Lapidary Handbook* by Howard.

The Earth Science Digest is most surely a welcome guest each month and I derive a considerable good from it.

Homer A. Herrick,  
612 Jewell Ave.,  
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ARIZONA, Doubly-Terminated, Quartz Xls. 10c and 25c each. Postage extra.

MARYANN KASEY  
BOX 230 PRESCOTT, ARIZONA

(From Page 26)

But these picturesque cliffs standing upon their bright red bases are not localized. Rather, they extend outside this district for miles, chiefly to the northwestward. To the east, they were not seen much beyond LaBarge Canyon, where they give place to granitic rocks, and apparently they do not range farther south than Bluff Springs Mountain. Likewise their northern limit is the Salt River, where they dominate the deep narrow-canyoned outlets of both LaBarge and Fish creeks. To the northwest, however, they cross State Highway 88 and are a very noticeable feature of the landscape to and beyond Bush Highway, although along this dirt roadway to the north they end at Stewart Dam, on Salt River.

(To Page 37)

## CLASSIFIED ADVERTISEMENTS

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**THIS MONTH'S SPECIAL** — Brazilian agate slabs, banded clear or banded carnelian, each slab will make at least eight 10x14 MM Cabochons. Very hard and polishes to a glassy finish. 50c per slab. Cut your Cabochons accurately from slabs marked with a George Davey Transparent Guide stamped with millimeter sizes. You can then order blank rings and brooches by size and fit your cab without recutting 3 separate assortments. Oval ring \$2.50; Oval brooch \$2.50; Square \$3.00. All the above postpaid. **Garden State Minerals, 1034 Bloomfield St., Hoboken, N. J.**

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## GEOLOGY QUIZ

(True - False)

1. Limonite is a hydrous oxide of iron.....(T) (F)
2. A common variety of amphibole is hornblende .....(T) (F)
3. Valley glaciers are rare occurrences .....(T) (F)
4. Cephalopods are good horizon markers .....(T) (F)
5. The largest obsidian flow in the world occurs in  
Yellowstone National Park, Wyoming .....(T) (F)
6. A *varve* is a deposit of marine fossils .....(T) (F)
7. Limestone is flexible and will distort under pressure.....(T) (F)
8. Gold lodes occur as far as a mile below the surface  
and can be mined at this depth .....(T) (F)
9. The first trilobites occurred in the Cambrian period.....(T) (F)
10. *Lepidodendron* was a Pennsylvanian scale tree .....(T) (F)
11. No evidence of prehistoric man has been found in the  
United States .....(T) (F)
12. Many geologic formations are worldwide in extent.....(T) (F)
13. Pyrite is softer than chalcopyrite .....(T) (F)

(Answers on next page)

## RED SANDSTONE

A New England subscriber recently wrote us that he would like to know why fossils are rare in red sandstone. With the exception of a few beds, fossil remains, marine or otherwise are exceptionally rare. This is because complete oxidation has destroyed organic compounds. The inorganic remains are usually altered. The Triassic red beds of Connecticut have abundant animal tracks but skeletal remains are scarce. Imprints are about the only fossils that occur in red sandstones in this country.

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## Answers to Geology Quiz

1. True.
2. True.
3. Valley glaciers are the commonest glacier in existence today.
4. True. Cephalopods are good horizon markers. When the animal dies the shell may float thousands of miles thus assuring even distribution of a given species in rocks of a given formation.
5. True.
6. False. A varve is a laminated sedimentary clay showing changes in season much as the rings in a tree mark years.
7. True.
8. True. Gold lodes have been followed as far as 8,000 feet into the earth in Brazil and 9,000 feet in South Africa.
9. True.
10. True.
11. False. Much has been found to indicate the presence of ice age man in North America. Particularly the United States. Watch for an article about this in a forthcoming issue of the Digest.
12. False. No known geologic formation is worldwide in extent.
13. False. Pyrite is harder than chalcopyrite. Pyrite's hardness is 6 to 6.5. Chalcopyrite is only 3.5. Pyrite is unusually hard for a sulphide.



## COVER PHOTO

A departure from our usual scenic cover photo is the *electron diffraction pattern* on this month's cover.

Electron diffraction patterns are useful in unravelling the space lattice structure of crystals, both in natural minerals and in artificial products, and in the determination of minerals which are too fine-grained to be recognized or differentiated by grosser techniques. Clay minerals may be identified by the type of electron diffraction which they present.

These pictures are taken by mounting a very, very thin, dry layer of clay from a water suspension on an electron-transparent medium and placing this preparation in a beam of electrons in an electron microscope. The electrons are diffracted by the orderly arrangement of atoms in layers, sheets, or rows inside the crystals and therefore register the rings seen in the pictures. The sizes, relationships, and intensities of the rings are characteristic of the atomic arrangements, which in turn are characteristic of certain minerals. Hence, minerals are determined from a study of the ring pattern, usually in comparison with patterns of known minerals.

Electron micrographs show external shapes; they are simply another variety of a magnified image. The electron diffraction patterns depict an interior arrangement.

The pattern on the front cover is of diaspore which occurs as a sedimentary clay. Its composition is  $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$ .

(From Page 32)

But in this outside region they are considerably thinner.

Back in the Weaver's Needle area, the cliffs have an estimated thickness of five hundred to over six hundred feet and lie practically level with the horizon; but at the northwestern edge of the area they dip



Field Camp at East Boulder.

west at a low angle, perhaps indicating a depression in the Eocene sediments beneath, or possibly the curved roof segment of an immense eroded laccolith, though the former supposition is more likely. However, the post-Tertiary erosion in the Needle region was evidently enormous, for the deep canyons were thus carved and scoured to bedrock, with most of the rubble flushed away. Present stream sands and boulders, and possibly most of the low gravel ridges, result directly from annual spring freshets of relatively present times.

Weaver's Needle itself is an erosion remnant of a basaltic volcanic plug, which intruded the agglomerate tuff that now encircles its base in the form of the usual buff cliffs. The eroded walls of the nearby canyon heads show this plainly, with the tuff capped by the dark basalt that matches the giant plug towering above. As a matter of fact, one is led to think this may be the center of local volcanic activity.

Now, in the creek bank on the side of one canyon, where erosion has been heavy, there is a partial exposure of another lower rock member that resembles latite, with colors from light gray to pale lilac. Also, here and there, float specimens were picked up that closely resembled jas-

(To Page 39)

## QUESTIONNAIRE

**Purpose:** To secure the majority preferences and opinions on matters pertaining to the proposed federation of mineral societies and related organizations throughout the United States and Canada.

**Name:** You may mark one majority choice of your society, or indicate relative preferences in any convenient way. Name should be as short as possible, consistent with clearness and accuracy.

1. American Federation of Mineral Societies....(Organizations; Clubs) .....
2. National Federation of Mineral Societies.....(Organizations; Clubs) .....
3. Federation of American Mineral Societies....(Organizations; Clubs) .....
4. American Fed. of Earth Science Societies....(Organizations; Clubs) .....
5. National Fed. of Earth Science Societies.....(Organizations; Clubs) .....
6. Fed. of American Earth Science Societies....(Organizations; Clubs) .....
7. Federated Geological Societies of America..(Organizations; Clubs) .....
8. Other name .....

**Sections:** Individual activities or membership will not be restricted to any particular sections. Sections, however, will make it possible to divide convention programs and displays to cover all interests for which there is an adequate demand. You may mark any number of choices in any convenient way.

- |                            |                           |
|----------------------------|---------------------------|
| Mineralogy Section .....   | Archaeology Section ..... |
| Paleontology Section ..... | Junior Section .....      |
| Geology Section .....      | Others: .....             |
| Gemology Section .....     | .....                     |
| Lapidary Section .....     | .....                     |

**Conventions:** How often should the conventions be held to supplement those of the regional federations and avoid conflict or duplications?

- |                     |                     |
|---------------------|---------------------|
| Yearly . . . . .    | Every 2 years ..... |
| Every 3 years ..... | Other choice .....  |

**Affiliation:** Should there be provision for membership in the federation by local societies not otherwise affiliated with a regional federation?

- |          |         |
|----------|---------|
| Yes..... | No..... |
|----------|---------|

Please fill in:

- Full name of your society .....
- Location .....
- Approximate membership .....
- Name of officer .....
- Position .....
- Mailing address .....

Preliminary Organizing Committee: Ben Hur Wilson; Richard M. Pearl.

Advisory Members: Ernest W. Chapman, California; Alger R. Syme, Mid-West; Junius J. Hayes, Rocky Mountain; E. E. Walden, Northwest.

Please return before May 15 to: Richard M. Pearl, Colorado College, Colorado Springs, Colorado.

### National Federation

(From a letter by Mr. Pearl to the secretaries of individual mineral clubs.)

Richard M. Pearl, Dept. of Geology,  
Colorado College,  
Colorado Springs, Colorado

After a postponement made necessary by the war, plans are again underway to organize a national federation of mineral societies, which will unite the regional federations and serve as a nucleus for the many local clubs interested in various phases of the earth sciences. At a recent convention of the Northwest Federation, the secretaries who were present as representatives of the various federations were urged to carry on correspondence with other federation secretaries. Such a proposal meets with the approval of the editors of the national magazines devoted to our subject, and will have their full support. Ben Hur Wilson of Joliet, Illinois, and I are the Preliminary Organizing Committee, co-operating with the Advisory Members in endeavoring to draw up the preliminary arrangements, and we need and want your aid.

It has been suggested that Denver, because of its geographic location as well as its being the center of population of the mineral collecting fraternity, would be a fine place for the first meeting. August 1948 has been set tentatively as the time—to coincide with the 100th anniversary of the discovery of gold in California. This was the most significant event in the mineral history of the United States, and one which mineral enthusiasts in every part of the country can celebrate with personal interest.

A preliminary meeting to organize the federation is set for June 13, 1947 at the time and place of the annual convention of the Rocky Mountain Federation in Salt Lake City, Utah. This seems like a convenient occasion for delegates from

each of the regional federations to meet together in the actual task of setting up the framework. The officers of each regional federation will have the responsibility of appointing two delegates and sufficient alternates. The Advisory Members have already been appointed.

On the opposite page is a questionnaire. Society secretaries who have not received one of these should fill in this questionnaire, detach, and mail to: Richard M. Pearl, Colorado College, Colorado Springs, Colorado.

---

(From Page 37)

per, but which more probably were an altered contact-basalt from walls of adjacent dikes. It seems likely, because other hand specimens of similar aspect shows one surface slicken-sided, with vertical striae that indicates a vertical movement in the plane of the dike.

With respect to faulting, few of major proportions were noted, with the exception of one that occupies the entire center of Bluff Springs Mountain, from northeast to southwest. Along this fault there is a drainage creek flowing northeast, which forms Bluff Spring Creek and empties into Needle Creek, near the mouth of Needle Canyon. The characteristic buff cliffs on the westerly side of this fault are much lower than those of the opposite side, where the eroded flanks rise to form some of the higher peaks of this district. This fault may be a spur of the one showing along LaBarge Canyon, or actually perhaps the southern portion of it. Our investigation didn't go that far.

However, there is a change of rock formation along it, which is evident even at some distance. Moreover, there is a cupola or maybe a belt of granite some miles south of Bluff Springs Mountain, on upper LaBarge Creek, which contacts schistose rocks. We didn't see it, but

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were told about it by William Barkley, cattleman and son of "Tex" Barkley, who lives at First Water to handle their stock grazing over all the Needle region. This may be a belt from the known dioritic granite to the east of LaBarge Creek, or more likely it is a surfaced exposure from an underlying pre-Cambrian magma, as we previously surmised.

And there is a similar exposure five or six miles west from the Needle, which we did examine in a perfunctory manner. It crosses that roadway into First Water from Highway 88, and is exposed along a dry sandy wash for about a hundred yards, but lies level with the general ground surface. Apparently this is a belt of coarse-grained gray-green true granite, width and length unknown. Surface exposures seem highly altered and are crumbly. Accessory minerals include orthoclase feldspar, some scanty biotite, and quartz phenocrysts stained a faint green no doubt due to a small amount of chlorite. There were no ferro-magnesian minerals seen in this superficial examination, nor any hornblende, or pyrites. Here, as in the LaBarge exposure cited, this may be a tongue, or belt, extending here from the known granites of the Mazatzal Range north of Salt River; but likewise it could be a western anticlinal fold of uncomformable granites beneath the Needle rocks.

Now, in summing up the above description, we think the facts obtained clearly show that there is no gold, Spanish or otherwise, in this over-publicized district—nor can be, including the "Lost Dutchman

Mine". Naturally, our findings are superficial and are especially lacking in detailed mineralogical data; but, even so, there is enough factual information concerning the rock formation in general, to make certain that the search *here* for Peralta or Walz gold is foolish, for it just does not exist. So, the hunt must be elsewhere.

We know early Spanish miners worked good mines throughout the great Southwest, and it is sure that Pedro Peralta also mined rich gold ore and that his whole party was wiped out at the north end of Old Superstition Mountain; but, nobody knows *how far* his party had been chased by the Apaches, before the massacre. That is, just where his mines were.

Likewise, it is a fact that Jake Walz had a mine somewhere, from which he brought gold into Phoenix; but, we now feel very certain that it *didn't* come from anywhere near the Needle. However, he was known to have found good placer gold somewhere north from what is now the Globe district; and, this could also mean quartz gold as well. The U. S. Geological Survey, and the State Bureau of Mines, report both placer gold and lode gold in the diorite-metamorphic contact lying up west-northwest from Globe and the Walz ore may have come from there. Or, it may have come from the granites northwest of LaBarge Creek. Figure it any way you please, but don't hunt for it around Weaver's Needle!

Incidentally this winter, we were told of a place well outside the Needle district, of a granite-sedimentary contact where several reliable old-timers had been able to pan good gold strings, but had never located a pay placer, nor any parent vein—what's that? More hearsay stuff? Well, *amigo, mebbe ya got sump'n there.*

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